

Serial No.: 10/067,265
Atty. Docket No.: P67585US0

REMARKS

By this Amendment, Applicants have canceled claims 2-4, amended claims 1, 5 and 9-11 and added claim 15. Claims 1 and 5-15 are pending in the application. In view of the amendments and remarks contained herein, favorable reconsideration in this application is respectfully requested.

The Examiner rejected claim 12 under 35 U.S.C. 112, second paragraph, as being indefinite. Through amendment of claim 1 herein, Applicants have overcome the rejection of claim 12 and request favorable reconsideration thereof.

The Examiner rejected claims 1-3, 12 and 13 under 35 U.S.C. 103(a) as being unpatentable over U.S. Publication No. US 2002/0187434 to Blatchford in view of U.S. Patent No. 6,458,284 to Kashihara or U.S. Patent No. 6,150,263 to Lin. The Examiner also rejected claims 4-11 and 14 as being unpatentable over Blatchford in view of Kashihara or Lin, and further in view of Wolf and Tauber, "Silicon Processing for the VLSI Era" ("Wolf and Tauber").

As set forth in claims 1 and 15, the present invention is directed to a method of manufacturing a narrow bit line by successively forming a conducting layer and an insulating layer on a substrate, forming a photoresist film on the insulating layer, and etching the photoresist film using a photolithography process to form a first mask pattern on the insulating layer. The first mask pattern is etched by an isotropic dry etching so as to form a second mask pattern, with the isotropic dry etching being carried out with plasma dry etching equipment which uses a microwave energy source. Part of the insulating layer is removed by a first anisotropic dry

Serial No.: 10/067,265
Atty. Docket No.: P67585US0

etching process using the second mask pattern, after which the second mask pattern is removed and the conducting layer is etched by a second anisotropic dry etching using the remaining insulating layer, so as to form the bit line.

Blatchford, Kashihara and Lin do not disclose etching the photoresist pattern by isotropic dry etching to form a first mask pattern, and thereafter etching the insulating layer by first anisotropic dry etching, followed by etching the conductive layer by second anisotropic dry etching, as set forth in amended claim 1 and new claim 15. The teaching of Wolf and Tauber, while generally teaching the known techniques of isotropic and anisotropic etching, does not disclose or suggest the specific combination of steps currently being claimed. It cannot fairly be said that the teaching of these etching techniques as a general matter renders all specific applications of such techniques in particular step sequence combinations to be obvious. Accordingly, Applicants request reconsideration of amended claim 1 and favorable consideration of new claim 15.

Claims 5-14 are also in condition for allowance as claims properly dependent on an allowable base claim and for the subject matter contained therein. Favorable consideration is requested.

Attached hereto is a marked-up version of the changes made to the application by the current amendment. The attached pages are captioned "Version with Markings to Show Changes Made".

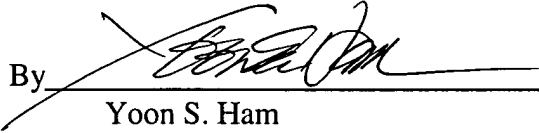
Serial No.: 10/067,265
Atty. Docket No.: P67585US0

With the amendments contained herein, the application is in condition for allowance. Should the Examiner have any questions or comments, the Examiner is cordially invited to telephone the undersigned attorney so that the present application can receive an early Notice of Allowance.

Respectfully submitted,

JACOBSON HOLMAN PLLC

By



Yoon S. Ham
Reg. No. 45,307

400 Seventh Street, N.W.
Washington, D.C. 20004
Telephone: (202) 638-6666
Date: May 5, 2003

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 2-4 have been cancelled and claims 1, 5 and 9-11 have been amended as follows:

1. (Amended) A method of manufacturing a bit line, the method comprising the steps of:
 - successively forming a conducting layer and [a hard mask] an insulating layer on a substrate, the conducting layer serving to form a bit line;
 - forming a photoresist film on the insulating layer;
 - etching the photoresist film using a photolithography process so as to form
 - [forming] a first mask pattern on the [hard mask] insulating layer in such a manner that a desired region of the [hard mask] insulating layer is exposed;
 - [isotropic dry] etching the first mask pattern by an isotropic dry etching[,] so as to form a second mask pattern, wherein the isotropic dry etching is carried out with plasma dry etching equipment, which uses a microwave energy source;
 - [etching the hard mask] removing the insulating layer by a first anisotropic dry etching using the second mask pattern;
 - removing the second mask pattern; and
 - etching the conducting layer by a second anisotropic dry etching using the remaining [hard mask] insulating layer, so as to form the bit line.

Serial No.: 10/067,265
Atty. Docket No.: P67585US0

5. (Amended) The method as claimed in claim [3] 1, wherein the isotropic dry etching is carried out while oxygen gas is supplied.

9. (Amended) The method as claimed in claim [3] 1, wherein the isotropic dry etching is carried out using a source of power of less than 400 Watts.

10. (Amended) The method as claimed in claim [3] 1, wherein the isotropic dry etching is carried out using a source of power of 200 to 300 Watts.

11. (Amended) The method as claimed in claim [3] 1, wherein the isotropic dry etching is carried out using a pressure of 600 to 1000 mT.